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ANÆSTHETIC EMERGENCY WORK.

THE necessity for an administration of anæsthetics in an emergency case often gives rise to a difficult problem. This is not confined to private practice, as is clearly shown in the article which we publish on page 15. Indeed, the problem is often in a way simpler in private than in hospital practice, for if the urgency is extreme there is probably no alternative. The man on the spot is the only person available for the duty, and, experienced or inexperienced, he has to undertake the task. Whether the same cogency should ever be allowed to dominate the situation in hospitals is the question which our contributor raises. In the case of large hospitals there are always available men of experience; yet we are shown that in a large proportion of emergency cases their skill is not requistioned. Why, it may be asked, is there not a rota for emergency anæsthetic work at big hospitals just as there is for other specialists and for medicine and surgery? The question is partly answered by the presence of resident anæsthetists, who are justly to be regarded as men of especial experience and skill. With regard to the visiting anæsthetists, it appears that it would be obviously unfair to treat them in the same way as the honorary physicians, surgeons, aurists, etc., in this one respect if they are not also equally treated in other respects.

If their standing on the staff is the same as that of the other honorary officers, and their share proportionate in the teaching emoluments of the place, then it seems just enough that they shall be required to take their share, too, in emergency work. At most hospitals it is still true that the majority of the visiting anæsthetists are not on a level with the rest of the medical staff. Therefore, when both their remuneration, direct or indirect, from the institution and their position in it are

inferior to those of their colleagues, it would be inequitable to demand emergency work from them unless some compensation for this was provided.

We do not doubt that, at any rate among the younger men, there would be perfect readiness, if not eagerness, to act as our contributor suggests, and to serve on a rota for emergency cases. Nevertheless, we believe that if hospitals generally were to bring such an arrangement into force they ought in justice either to improve the position or else the emoluments, or both, of the anæsthetists attached to their working medical staff.

The practical difficulty of getting the required man in time, in cases of emergency, can hardly be considered any obstacle nowadays. Telephones and motor-cars have reduced time and distance almost to a negligible dimension, and although, no doubt, in the past these were considerations that weighed in the balance against employing visiting anæsthetists out of set hours, the conditions are quite different to-day. And it may equally be claimed that the conditions are quite changed as regards the actual work required. There are to-day special and sometimes elaborate methods available that may, in a particular case, be the sole means of giving the patient the best possible chance.

It seems but right that in every big institution it should be the practice to bring these special methods into play when the patient's condition demands them. When it is only by the presence of a visiting anæsthetist that this can be achieved, obviously arrangements should permit of his being summoned.

AVERTIN TECHNIQUE IN THYROID SURGERY

By I. N. Lewis, M.R.C.S., L.R.C.P.

Assistant Anæsthetist to St. George's Hospital, Anæsthetist to St. Andrew's, The Metropolitan, and Golden Square Hospitals.

WHEN avertin was first introduced into this country under the sponsorship of Sir Francis Shipway and Dr. Blomfield, I was privileged to assist Dr. Blomfield with many of his cases at St. George's Hospital. The experience I had there impressed me very favourably towards the new drug, particularly with regard to its possibilities in thyroid surgery.

Unfortunately, owing to a perceptible death-rate associated with the first few hundred cases, avertin was generally regarded with reserve and suspicion by the majority of British surgeons and anæsthetists.

I have all the details of the circumstances surrounding those early fatalities, and there was no doubt in my mind of the innocence of avertin as the cause of death, with one exception. That was the case in Liverpool, and it still remains inexplicable. It was a case of a young healthy man who was operated upon for hernia and, although he had a normal dose of avertin, supplemented by ether, nevertheless perished soon after recovering consciousness. This one case led one to consider the grave possibility of the existence of idiosyncrasy to the drug. Therefore it was with the utmost caution that the study of its effects in thyroid operations was initiated.

As a preliminary, I endeavoured to make a study of its effect in rabbits. This research was performed in the Laboratories of St. George's Hospital in conjunction with Dr. T. F. McNair Scott, who was then Medical Registrar.

An article published by Parsons of Cambridge in the *British Medical Journal* of October 19th, 1929, gave us what appeared to be a simple and speedy method of estimating the rate of excretion of avertin as a bromine compound in the

urine. We proposed to study the influence of thryoxin on the rate of excretion of avertin in rabbits, with a view to drawing a rough analogy in the case of human beings.

To our extreme chagrin the only result of some months' work was that we were in a position to disprove the whole of Parsons' work on this method of estimating bromine in the urine, also depriving ourselves of a means of making what might have been a valuable study.

At the present moment all we can say is that no satisfactory method exists for estimating rapidly the rate of excretion of organic bromine in the urine. One point only emerged—none of the rabbits we used showed any idiosyncrasy, and the only fatality in our menagerie was that of a gluttonous young buck who died two days after he had recovered from his injection, and the post-mortem showed that death was due to over-eating—a not uncommon form of demise in tame rabbits.

I mention these apparently irrelevant and abortive investigations merely to ensure that no other workers will be misled into adopting this useless method.

So I was obliged to proceed to my investigations in the human being armed with impressions rather than with facts. At St. Andrew's Hospital, Dollis Hill, Mr. J. Basil Hume very kindly put his thyroid cases at my disposal for avertin anæsthesia. I here present the facts and figures of a series of twenty cases that we did, not only without fatality, but with positive benefit.

Meticulous care was exercised in every case to ensure that all details of the technique were uniform and invariable, for if any untoward results were to occur we were determined to identify their precise origin. In every case I made up the avertin solution myself, and in every case was present at, and controlled, the administration. I am anxious to emphasise the extraordinary care we used in order to give support to any dogmatic assertion I may make in favour of avertin in this connection.

And now to consider the cases themselves. They were all females, varying in age from 15 to 58. For comparative purposes it was decided to include toxic adenomata in the list, as well as cases of Graves' disease proper.

In the first dozen cases omnopon gr. $\frac{1}{3}$ was given as a routine, but as the technique improved it was omitted and the true technique of "stealing" the thyroid practised. The doses of avertin required when omnopon was omitted were not appreciably larger and there was less respiratory depression. With regard to respiratory depression, in the doses we used there was no abnormal interference with the respiration in any case.

Our routine procedure was as follows:—

Forty-five minutes before the operation is to begin the avertin rectal injection is started. This moment is zero. A calculation has been previously made on the basis of 0.045 grm per pound body weight, and about two-thirds of this dose is run in as quickly as the patient will tolerate it. This is usually completed at five minutes. At ten minutes the patient is tested for replies to questions and again at 15 and 20 minutes. Between these three times it is possible to judge the reaction of the patient to the avertin very finely. In general, drowsiness at ten minutes indicates susceptibility, between 15 and 20 is normal, and over 20 indicates resistance. A supplementary dose is then run in, its quantity depending upon the estimation of the patient's requirement made from the previous observations. It is in the selection of a supplementary dose that the judgment of the observer is exercised. But with the data given, by careful observation of the above details, it is soon possible, with a little experience, to judge the dose that will give a uniform depth of narcosis in every case. With a supplementary dose, at 30 minutes from zero, the patient is properly narcotised, with pin-point pupils, absent corneal reflex, and regular deep respirations. With the doses I used there is considerable recoverability, and upon a painful stimulus applied to the inner side of the thigh reflex movements are elicited. There is complete muscular flaccidity and the jaw is easily manipulated.

In the theatre the patient is placed on the table. In some cases it is possible to introduce an endotracheal spatula gently and to intubate with a large rubber tube straight away. Introduction of the tube is invariably accompanied by attempts at coughing, but the glottis cannot, of course, be closed owing

to the presence of the tube. The spasm occurs for only a few seconds in an ideal case, and the patient relapses once more into coma.

In the earlier cases it was customary to use a local anæsthetic for the skin incision and to proceed with the operation without additional anæsthetic until the patient became intolerant of the manipulations, at which point gas-oxygen was administered through the tube previously inserted.

Lately, however, we have modified the technique and find it smoother to work with gas-oxygen in use the whole time, as this obviates any interfering manipulations in the midst of the difficult phase of the operation.

In cases that appear to be hyper-sensitive in the laryngeal area, the upper end of the larynx and the pharynx are sprayed with 20 per cent cocaine, as recommended by Magill. If the patient will not permit intubation as she lies, this manœuvre can be quite easily accomplished by administering a short gas. At present, in every case, having passed the experimental stage, I administer gas as a routine, introduce the tube and connect up immediately to a gas-oxygen apparatus.

A large rubber tube is used that completely occludes the trachia, and this is connected to a Magill's bag and valve unit, comprising a McKesson valve and reservoir bag, which may be used with any variety of gas-oxygen apparatus; I have usually used either a Boyle or McKesson.

The gas-oxygen need not be pushed until the moment for enucleating the tumour arrives, when the irritation of the trachea causes the patient to heave. This does not occur if the gas concentration is increased in anticipation of this moment. If apparatus for intubation is lacking, the gas-oxygen can, of course, be administered quite efficiently by a mask, but we have found that, apart from the convenience of removing the anæsthetist from the field of operation, in cases with large tumours, a far better airway is maintained, there is better control of gas-oxygen, and the whole operation proceeds more smoothly if a tube is used.

Intubation is widely condemned as an unjustifiable interference. One case, it must be admitted, complained of a sore throat afterwards, but this was due, I feel sure, to the fact

that her recoverability was marked, and, not having used gas for intubating, there was much coughing against the tube. The discomfort—it was nothing more—lasted but a day and would have been avoided if care had been taken sooner to prevent coughing. Apart from this one case, there has been no trouble at all. The tube is removed before the patient leaves the theatre. This act at once demonstrates the presence of a cough reflex.

In the ward the narcotic effect of the avertin usually keeps the patient quiet for an hour or two. A few cases have been restless immediately afterwards, and we have never hesitated to administer a dose of morphia as soon as this symptom appeared.

Notes on the Table.

In the table given it will be seen that the dose calculated according to body-weight does not necessarily coincide with the dose actually given, although the depth of narcosis obtained was approximately uniform. This serves to illustrate the thesis that, while body-weight is useful as a rough guide to dosage, the true estimation is only to be obtained by studying the basal metabolic rate of the patient. I have included, for what it is worth, a calculation of the basal metabolic rate of each patient according to Read's formula, and it will be seen to give an approximate relation to the rapidity with which the patients succumb to the drug. In each case the pulse and blood-pressure readings were taken, as far as possible, at a quiescent period.

The influence of metabolism is observed most markedly in the extreme cases, e.g. No. 6, with a high metabolism, requiring a large dose, and conversely No. 7 who was obviously sub-thyroid and required a very small dose. Individually, several of the cases are of interest. No. 1 was the most severe case, markedly hyper-thyroid, with auricular fibrillation and a positive Wassermann reaction. It will be observed that it took 40 minutes to achieve a satisfactory degree of narcosis. The dose given was kept as low as possible, as we were extremely perturbed by her condition. Gas-oxygen was given by a mask and recovery was excellent.

			Weight in lbs	Dose calc.	Dose given	Prelim. inj.	Type of case	Suppl. Anæs.	Post-operative condition	Induction period	B.P.	P.	B.M.P.
1.	F.	39	115	5.2	5.7	Om. ⅓	Graves'	$N_2O.O.$	Good	40 m.	125/90	120	+31.97
2.	F.	53	135	6.075	6.075	Om. ⅓	Toxic Adenoma	Local $N_2O.O.$	Good	20 m.	125/70	100	+30.60
3.	F.	31	100	4.5	4.5	Om. ⅓	Cyst-Adenoma	Local $N_2O.O.$	Slight vom.	18 m.	130/80	80	+14.0
4.	F.	50	84	3.78	3.78	Om. ⅓	Graves'	$N_2O.O.$	Slight vom.	20 m.	160/80	85	+35.73
5.	F.	25	99	4.5	5.0	Om. ⅓	Toxic Adenoma	$N_2O.O.$	Slight vom.	15 m.	150/80	80	+26.169
6.	F.	20	121	4.99	6.0	Om. ⅓	Graves'	$N_2O.O.$ intub.	Good	15 m.	148/70	105	+48.16
7.	F.	37	130	5.85	5.0	Om. ⅓	Adenoma Sub-Thyr.	$N_2O.O.$ intub.	Good	10 m.	135/80	80	+17.63
8.	F.	30	120	5.40	6.0	Om. ⅓	Graves'	$N_2O.O.$ intub.	Good	15 m.	130/80	80	+14.0
9.	F.	27	105	4.725	5.5	Om. ⅓	Graves'	$N_2O.O.$	Good	30 m.	148/70	100	+44.74
10.	F.	33	112	5.04	5.0	Om. ⅓	Cyst-Adenoma	$CHCl_3$	Nausea and vomiting	10 m.	135/80	80	+17.63
11.	F.	26	134	5.4	5.5	Om. ⅓	Graves'	$N_2O.O.$ intub.	Good	11 m.	140/75	100	+36.7
12.	F.	33	109	4.905	5.4	Om. ⅓	Toxic Adenoma	$N_2O.O.$ intub.	Vomiting very slight	12 m.	125/80	80	+10.8
13.	F.	49	127	5.625	5.5	nil.	Toxic Adenoma	$N_2O.O.$	Good	25 m.	125/75	70	+9.0
14.	F.	46	108	4.86	5.0	nil.	Toxic Adenoma	$N_2O.O.$ intub.	Good sore throat	15 m.	198/110	90	+42.1
15.	F.	58	111	4.95	5.0	nil.	Toxic Adenoma	$N_2O.O.$ intub.	Good	20 m.	140/80	78	+18.65
16.	F.	19	125	5.625	5.0	nil.	Graves'	$N_2O.O.$ intub.	Good	30 m.	130/80	110	+34.36
17.	F.	32	119	5.355	6.0	nil.	Graves'	$N_2O.O.$ intub.	Good	20 m.	135/65	100	+39.82
18.	F.	28	88	3.96	5.0	nil.	Graves'	$N_2O.O.$ intub.	Good	30 m.	140/80	85	+23.40
19.	F.	15	98	4.41	4.5	nil.	Graves'	$N_2O.O.$ intub.	Good	15 m.	120/80	80	+7.7
20.	F.	46	114	5.13	5.5	nil.	Graves'	$N_2O.O.$ intub.	Good	15 m.	135/80	100	+30.6

No. 6 is also of interest, as she was a highly nervous young girl with a high metabolic rate, requiring a large dose. Recovery from the immediate effects of operation was satisfactory, but she bled into the cavity 36 hours later owing to a slipped ligature. Under pretext of giving her a saline, a dose of 5 grms of avertin was run in, an allowance of 1 grm being made for non-excretion of the previous dose. She passed into a quiet sleep, was removed to the theatre, the bleeding point ligatured, and to this day she is unaware that she made anything but an uninterrupted recovery.

Apart from this little incident, we are able to record an uneventful convalescence in every case. In the majority of cases there was no vomiting at all; in no case was there anything approaching severe vomiting. The one case in which any degree of vomiting occurred was No. 10, where we used chloroform as a supplement owing to the unexpected failure of our gas-oxygen machine.

Cases Nos. 17 and 18 are notable. Some months before thyroidectomy they both had their tonsils removed under avertin and gas-oxygen anæsthesia. A prominent feature of that episode was the absence in each case of any soreness of the throat—a phenomenon that I have repeatedly observed since in tonsil cases done under this form of anæsthesia. So pleased were the patients with their experience on that occasion that, although both very definitely hyper-thyroid, they came back for the major operation with gratifying equanimity and both made splendid recoveries.

We took blood-pressure readings before and after operations, but as no alteration of any consequence was noted I have not kept the individual records.

No cases of proctitis were observed.

Conclusions.

The results obtained in this sequence, together with a general experience of avertin as a basal narcotic, justify, in my opinion, a confident approval of its use in these cases.

I have endeavoured to demonstrate its safety and efficiency when used under conditions of scrupulous care and uniformity. I do not maintain that this technique is superior

to that used in removal of the thyroid under a local anæsthetic alone, but our results have been so unfailingly good that I have no hesitation in recommending it to those who have not the time to acquire the difficult art of local infiltration.

In conclusion, I have to express my gratitude to Mr. J. Basil Hume for his kindness in permitting what was at one time an experiment on his cases, and for his enthusiastic co-operation when he recognised the possibilities of the technique.

I have to thank Dr. J. Blomfield for his help and instruction when avertin was first used, and Dr. T. F. McNair Scott for his valuable co-operation in the research alluded to in this article, which we were unfortuna*e in not completing.

ETHER—OPEN OR CLOSED?

By Oswald J. Murphy, M.B., B.Ch., B.A.O.

Anæsthetist, St. Vincent's Hospital, Dublin.

Anæsthetics, like everything else in the world, are constantly undergoing changes, and this is inevitable.

For many many years chloroform reigned supreme and now, when it has reached a moribund stage, one looks back on the long trail of fatalities and minor tragedies for which it is solely responsible. Ether superseded it and has served us faithfully, and for routine work is still far the most satisfactory and reliable agent at our disposal.

The search for an ideal anæsthetic continues, and the time has now arrived when endeavours are being made to supplant ether, not on account of its danger to life so much as its unpleasant after-effects. Long though we have been using ether I am convinced that we are not getting the best out of it. Now there are several methods of administering ether, but the two usually employed are the "open" and the "closed."

There seems to be no unanimity as to which is the better, and this should not be. Some writers, in fact, who use only the open method barely mention the fact that closed ether can be administered. Such being the case, I propose to set forth briefly what seem to me the advantages and disadvantages of the two techniques, and then to consider if there is conclusive evidence in favour of one or the other.

Open ether requires a very simple apparatus and is the easiest and safest anæsthetic to administer. Induction is definitely slow, and therefore there is an unnecessarily long period of unpleasant nervousness through which the patient passes before consciousness is lost. Large quantities of ether are required to produce and prolong anæsthesia even with premedication.

As anæsthesia progresses, more and more ether is poured or sprayed on the mask, breathing becomes deeper and faster,

the ether vaporizes more and more rapidly, the mask gets colder and colder, with the very undesired result that the whole respiratory tract becomes chilled. As there is no limitation of free air there is no cyanosis and therefore less tendency to mucous secretion.

The resulting anæsthesia is quieter and the relaxation usually more satisfactory. This is doubtless due to the deep and rapid respiration, washing out and lowering the CO_2 content of the blood—this eventually leads to great quietening of respiration. This is accentuated with the use of morphia or omnopon preoperatively. The relaxation is due to the free supply of oxygen coming through the mask.

Closed ether, on the other hand, requires a more complicated apparatus so arranged as to allow nitrous oxide to be easily utilized for induction. Much smaller quantities of ether are used on account of re-breathing. Two ounces in the inhaler to start with, and a further ounce after 15 minutes, will see any ordinary case through an operation lasting half an hour or longer, and five ounces will usually see an hour through.

Induction is quick, provided the face-piece fits accurately, and no system of hot-water bottle heating is required to vaporize the ether, respiration does all that is necessary. Quick induction is very gratifying to the patient.

With re-breathing the respirations warm the vaporized ether and the respiratory tract escapes the chilling effects of the open method, and, in addition, the CO_2 exhaled is utilized.

With closed ether you have to guard against cyanosis with resulting secretion of mucus and rigidity. Also, you must guard against anæsthesia becoming too deep. Owing to a certain curtailment of free air the breathing is not so quiet, and relaxation not so pronounced, unless the anæsthetist "keeps his eye on the ball," to use a golfing expression.

These are the main points of interest and comparison which occur to me, and it will be seen that any competent anæsthetist will procure equally good results with either method, but this is not the beginning and end-all of the matter. The question arises as to which method is more beneficial for the patient, both from the patient's own point of view and from that of the surgeon. This brings us to the after-effects and

complications. As regards nausea, vomiting, retching, etc., I think these are somewhat less troublesome and prolonged after the closed technique, but I know many think differently.

The occurrence of lung complications following operation.

Bronchitis and pneumonia do occur, and will always keep occurring, and the cause usually is ascribed to the ether—by the surgeon.

What are the causes, and can they be eliminated? The obvious causes:—

(*a*) Chilling of the patient brought about by inhalation of large quantities of cold ether vapour, using the open method; or brought on by the operating theatre being cold; or by prolonged exposure of the intestines in abdominal surgery. The longer the operation lasts the greater is the fall of body temperature and eventually chill and shock start a vicious circle.

(*b*) Deep anæsthesia favours inhalation of foreign matter, which is a reason why there is almost always some focus of infection to be located—usually in the upper respiratory tract —in cases developing post-operative lung trouble.

(c) A large proportion of these lung complications follow abdominal section, especially in upper abdominal operations.

The cause may be found sometimes under *a* or *b*, but many are undoubtedly secondary to infarcts due to emboli or thrombosis or collapse of the lung base or bases due to paralysis of the diaphragm. Lung troubles due to these causes can never, so far as our present state of advancement goes, be abolished, but they can be lessened by gentle manipulation and good team work.

Chill can also be prevented by taking adequate precautions, from the time the patient leaves bed until such time as the bed is again reached, to see that no element enters into our technique which is likely to cause any lowering of the body temperature. At present the most prevalent cause is the use of open ether. Troubles due to foreign matter of a septic nature can be combated in many cases by preliminary toilet of the mouth, nose and throat.

Finally, we must consider open and closed ether in relation to the all important question of shock.

Shock, infinitesimal though it may be, starts with the illness or accident necessitating operative interference. Anticipation of the operation, the preparations, the anæsthetic, the operation, and sometimes the surgeon, all play their part. The patient passes through a barrage of shock-producing causes, and it is therefore of cardinal importance to protect the patient from each and every cause, so far as it is in our power. It is here that the choice between open and closed ether is all important and it is here that the difference between the two shows essentially.

With open ether no use is made of CO_2. In closed ether the patient's own CO_2 is conserved and utilized.

CO_2 plays a very important—and underrated—part in anæsthesia and in the prevention of shock. It is worth while giving it some consideration. Its first use lies in the fact that it is a respiratory stimulant causing a deeper and faster respiration, which materially lessens the time of the unpleasant sensations of induction.

Fall of blood-pressure under any anæsthesia is inevitable, but the use of CO_2, although not preventing it successfully, certainly combats and postpones the onset. It influences the circulation by helping the venous return to the heart and so prevents loss of volume through capillary stasis. As fall of blood-pressure is a manifestation of shock, the importance of using CO_2 looms larger. Another point is that CO_2 helps toward a more rapid clotting. Other points might be brought forward, such as lessening of gas pains, etc., but they would be more controversial.

If one admits the above actions of CO_2—and I think they are universally acknowledged—I do not see any excuse for the use of open ether. Open ether is almost too easy to administer, whereas the use of closed ether needs unending vigilance on the part of the anæsthetist.

In this brief article I have confined myself to discussing the two methods of using ether most in vogue, and I have avoided all mention of intratracheal—for which I have little use—and rectal ether, for which I have an ardent partiality.

The issue, I personally consider, is clear.

EMERGENCY ANÆSTHETICS IN HOSPITALS

By GEORGE EDWARDS, M.R.C.S., L.R.C.P.

Assistant Anæsthetist, St. George's Hospital, etc.

A PERENNIAL plaint goes up from successive generations of resident medical officers in the larger hospitals. They complain that they are expected to give anæsthetics to the dangerously ill, the toxic and the shocked cases, whilst the visiting anæthetists attend only for routine operations upon prepared subjects. The honorary surgical staff attend for emergency operations, but not the honorary anæsthetists, and this just at the time when the residents would most like to be relieved of anæsthetic duty.

We may reasonably consider that patients with perforated septic ulcers and with acute intestinal obstructions form a large part of the really serious cases that are surgical emergencies and that these may be taken as representative of the difficult and dangerous subjects for anæsthesia. The following figures cover periods of six months in hospitals of different type. They may help us to form a judgment of the extent to which just those very patients who most need an expert anæsthetist are deprived of his attention.

A. Provincial general hospital of 80 beds with two house surgeons:

All anæsthetics, routine and emergency, given by house officers.

B. Suburban general hospital of 200 beds with four visiting anæsthetists and five house officers:

Serious emergency cases—10.

All emergency anæsthetics given by house officers.

C. London general hospital of 350 beds with five honorary anæsthetists and eleven house officers, including a resident anæsthetist:

Serious emergency cases—36.

Anæsthetized by visiting anæsthetist—0
,, ,, resident anæsthetist—15
,, ,, house officers—21.

D. London general hospital of 650 beds with five honorary anæsthetists and twenty-five house officers, including a senior resident anæsthetist and four casualty officers on anæsthetic duty:

Serious emergency cases—56
Anæsthetized by visiting anæsthetists—5
,, ,, resident anæsthetists—31
,, ,, house officers—20

In A and B, 100 per cent; in C, 58 per cent; and in D, 36 per cent of these cases fell to the lot of the house physicians and house surgeons, whose anæsthetic experience at the beginning of their period of office was probably confined to the twenty administrations required during their training. To have a surgeon demanding complete relaxation of an abdominal wall, when one has no idea of how deep the patient is or of how deeply he can be placed with safety, and to be vividly aware that the patient is extremely ill and may find his way to the mortuary overnight, is an experience to which no one should be subjected except in very dire emergency. Towards the end of his engagement the house officer has learnt enough of anæsthetic administration to realize that he had been given a difficult task, before he had gained that experience from simpler cases which would have enabled him to do better work and would have saved him much distress and anxiety.

Realizing this, the houseman voices the biennial grumble in his turn. He is met with the equally periodic replies—that difficult cases provide good experience; that sick patients usually take anæsthetics very easily; that serious trouble most often occurs during simple operations upon apparently normal, healthy subjects. These answers, given with an air of experience and greater knowledge, silence the protester, though he may realize that they are inadequate. Difficulties teach, in anæsthetics as in all else, but one must walk before one attempts acrobatic dancing. Actually ill patients are easily induced, it is true; but they are equally easily knocked

out. Serious trouble occurs to the specialist anæsthetist only when it is entirely unexpected, simply because when it is expected it can usually be avoided. An administrator of experience can foresee and prevent most troubles or, at any rate, has the standing and authority to stop the operation or to refuse to give an anæsthetic at all. Now and again some completely unpredictable state of affairs arises, but for the most part the danger signals are quite definite and visible from afar. Further, a large part of the troubles of the inexpert anæsthetist may be due to his own making; he may add to the respiratory obstruction by putting in a badly adjusted airway, or may seek to stimulate a patient who is breathing shallowly by giving large blasts of oxygen.

Before the protesting junior has been able to cause any alteration in the traditional arrangements his time ends and a fresh generation succeeds. A new house officer is faced with anæsthetic duty and approaches his cases, be they for intestinal obstruction or for hallux valgus, with the same confidence or fear according to his temperament. In time he, too, finds out that he has been asked to do very difficult work with the minimum of experience.

The remedy is not hard to define but would be less easy to put into practice. Either the honorary staff of hospitals must be on call for emergency anæsthetics or else there must be two experienced residents, so that one may be always available. Surgeons have to take their turn at emergency duty and it would seem that anæsthetists should do the same. Various difficulties at once present themselves: some anæsthetists have general practices to attend; some surgeons prefer not to work with certain anæsthetists; the surgeon arranges the hour at which he will operate and fits it in with his other engagements, whilst the anæsthetist has to work at the surgeon's time; often a decision is not made until the patient is seen by the surgeon and such decision may be against operation, in which case either the anæsthetist has been called unnecessarily, or else the theatre has to await his arrival. None of these difficulties is, however, insuperable. The main opposition will probably be from those of us who do not want to add to our duties or who prefer to avoid those cases which have a definitely high operative mortality.

It is not possible to say how far the current system works against the patient. The cases we have taken contain most of the serious ones coming to operation, and so few of them were in the hands of the visiting anæsthetists that no comparisons are possible. Three deaths on the table occurred in the series, in each case a resident anæsthetist, presumably more skilled than his resident colleagues, was giving the anæsthetic. The methods of administration were almost equally the Clover gas-ether sequence and the chloroform-ether sequence. Spinal anæsthesia and gas-oxygen were not recorded. It is well recognized that though any qualified man may operate only those with special skill and command of technique should be asked to do so save in their absolute absence. Giving anæsthetics is now a highly technical job, requiring command of many methods and instruments and familiarity with many drugs. The "rag and bottle" regime still provides the finest training and will ever be a necessary groundwork on which to build up a specialist technique. This existence of a simple method, more or less, does not mean that anyone can or should be asked to anæsthetize, especially for an emergency operation, if experienced help can be obtained. In the interests of all, save, perhaps, themselves, skilled anæsthetists should be ready to assume emergency duty in hospital as well as in private.

A DOUBLE MASK FOR ANÆSTHESIA

By K. E. MADAN, M.D., D.O.M.S.

Lecturer in Anæsthetics, King Edward Medical College, and Chief Anæsthetist, Mayo Hospital, Lahore.

THIS mask is an improvement on Schimmelbusch's mask, which is generally used for the open ether method of anæsthesia.

My mask is slightly bigger, having $4\frac{1}{4}$ inches breadth and 5 inches length, is strong and light, and its bands, which are meant to support the lint, gauze, or other material on which ether is poured, can be folded or bent down towards the base of the mask. The ring which forms the cage is hinged to the handle of the mask, and can be opened and closed by releasing or fixing the catch at the other end of the mask. To this cage are fixed two metal bands which curve upwards and cross in the middle. These upper bands are three-quarters of an inch away from the lower bands of the mask in the middle line, and can also be made to fold or bend down towards the base of the mask, so that the whole instrument can be conveniently carried in the pocket.

TECHNIQUE OF USING THIS MASK, AND ITS ADVANTAGES.

I use two layers of lint to be stretched on the lower bands over the mask, as it is more economical than other things, but several layers of gauze may also be stretched instead, or flannelette, or other material.

Ether is quickly poured from a dropper with a long beak, e.g. Bellamy Gardner's, and a small thick towel is put on the upper bands fixed on the cage, so that it covers the entire mask without touching the lint or gauze on which ether is dropped. This is of advantage, as the towel cannot get soaked by the absorption of ether as takes place when the

towel is kept directly in contact with the material (lint or gauze) on which ether is poured. Hence ether is not wasted.

Besides, the anæsthetist prefers to hold the mask and towel in position when the latter is dry than when it is soaked, in which case the fingers often get benumbed and crampy during a prolonged administration.

The mask is made to stand on a broad, thick ring of lint or gamgee placed over the face with the object of protecting the eyes, and preventing fresh air from entering or exhaled air from escaping by the sides of the nose; it also does away with the necessity of applying vaseline on the face.

As less evaporation of ether vapour takes place by this method, the anæsthetist, as also the operator and his assistants, inhales hardly any ether vapour, which is advantageous as constant imbibing of ether vapour is injurious to health.

The main advantage is that by simply closing the mask two closed chambers are at once formed, one between the patient's face and the under surface of the lint or gauze, and the other between the upper surface of the latter and the under surface of the towel. Hence I call my mask a Double Mask, as with the ordinary types there is only one chamber available.

There is re-breathing, and the upper chamber contains air mixed with exhaled ether vapour, as the material stretched on the mask for dropping ether is such as to permit respiration to take place through its layers. The greatest height of the lower chamber is $2\frac{1}{4}$ inches, and of the upper chamber is three inches. This method helps to maintain a proper percentage of ether vapour inhaled; the ether is to be dropped in such a way that the mask always remains moist; the patient's head is kept turned on one side, and it is in most cases necessary to lift up only one end of the towel and quickly pour the ether only on the upper half of the surface of the mask and at once replace the towel; a percentage of between 10 and 17 can be obtained. Frequent douching of ether on the whole mask to keep it wet is necessary in cases of strong and alcoholic subjects, and thus a percentage of 17 or 18 is obtained. Other advantages are that the ether vapour gets heated by this method, which is really a semi-closed method.

Heated ether vapour is twice as safe as cold ether vapour. Less amount of ether is required, as it is not allowed to evaporate freely; hence the method is valuable in hot countries. The maintenance of anæsthesia is rendered easy, even in troublesome cases, e.g. of strong and alcoholic persons. The mask, being made of light material, is less weighty on the face than heavy inhalers employed in the closed ether method. There is less trouble from headache than by the closed method.

A SIMPLE ETHER APPARATUS.

By R. W. Hornabrook, M.B., B.S., Melbourne.

THE apparatus illustrated is very simple, cheap, and efficient. It is all that is really required for any operation if the administrator desires to administer the anæsthetic through the nose or mouth.

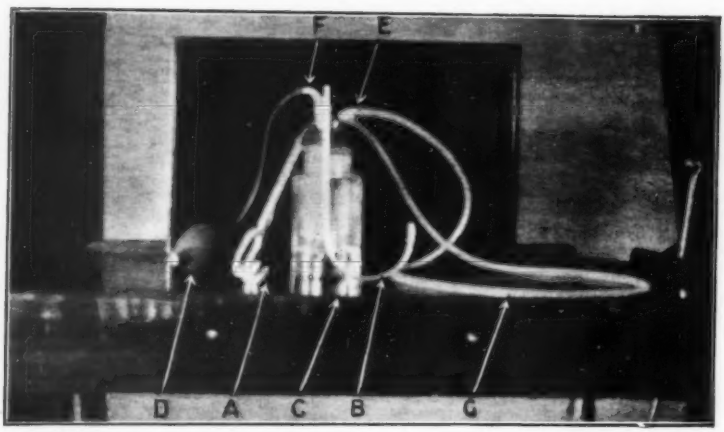
The procedure is as follows:—

First, fully induce anæsthesia by the open ether or open ethyl chloride-ether sequence. The bottle containing the ether is 12 ounces, but may be of less size if desired. Into this bottle is placed about three ounces of ether. The bottle is stood in a bowl containing hot water 105–110 degrees. The anæsthetist then gently squeezes pressure bulb D, and holds metal nasal tube, or No. 8 catheter, or Davis gag, whichever he may have attached to the 4 ft. rubber exit tube, to his nose and smells if the ether vapour is coming away freely. Having ascertained this, he inserts the nasal tube into the nostrils, or the No. 8 catheter or Davis gag into the mouth, and presses intermittently on the pressure bulb. It is quite unnecessary to use very forcible or rapid pressure on the bulb. It is only necessary to press the bulb intermittently at intervals for a few seconds or even a few minutes, when the patient is under. The amount of ether used is very small, as every drop must go to the patient and none is wasted—three to four ounces in an hour should be ample.

No liquid ether can enter Exit Tube E, as it extends only just through the rubber cork.

Inlet Metal Tube F extends to within a quarter of an inch of ether but not right into the liquid.

The method gives excellent abdominal relaxation with quiet regular respiration. The apparatus can be used for any operation about head, neck, throat, etc.



A—Metal nasal tube; B—No. 8 catheter for administration through mouth; C—12 oz. bottle with 3 oz. of ether; D.Pressure bulb attached to inlet tube; F—Inlet metal tube comes to within half-inch of ether; E—Exit metal tube only just through cork (rubber); G—4 ft. rubber tube attached to exit tube.

Davis' gag can be attached to this tube for mouth operations in place of catheter.

The Davis gag is better than No. 8 catheter for throat work.

The metal nasal tube can be used for any class of case except nose work.

The whole outfit can be made for less than 15/-. There are no stop-cocks or valves to take up attention. Towards the end of the operation the ether is emptied out, and air administered by means of the apparatus. It is simply a method of conveying ether vapour to the patient, free entirely from any electrical connections or complications of any sort, and is all that is required if a man knows his work.

A little chloroform may be added to the ether if the anæsthetist desires, but I have never found this necessary. The warm ether is sufficient.

If the anæsthetist should start to use this method before the patient is fully anæsthetised he may find that, on inserting the nasal tube, or the Davis gag, the first onrush of ether may cause the patient to cough. For this reason the patient should be fairly well anæsthetised before inserting either of the above.

A—Metal silver-plated nasal tube.

B—No. 8 metal catheter for administration through mouth.

C—12 ounce bottle, containing three ounces of ether.

D—Pressure bulb attached to inlet tube.

E—Exit metal tube only just through rubber cork.

F—Inlet metal tube which passes through rubber cork to within a quarter of an inch of ether surface.

G—Four foot rubber tube attached to exit tube, to which can be attached either metal nasal tube, No. 8 metal catheter, or Davis gag, as desired.

CRITICISM OF A METHOD OF ESTIMATING THE EXCRETION OF AVERTIN.

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IN the *British Medical Journal* of October 19th, 1929, was printed an article on the "Pharmacological Aspects of Avertin." Included in this was a study of the rate of excretion of avertin estimated by quantitative analysis of the urine. An accuracy of 99.8 per cent was claimed for the method as demonstrated by test experiments.

With a view to adopting it in research we gave the method a careful examination, and regret to have to report that it is fundamentally unsound and inaccurate.

Briefly, the method consisted of evaporating a known quantity of urine to dryness with sodium carbonate in an open crucible, fusing to get rid of organic matter, and dissolving the ash in $2N.H_2SO_4$. The solution was then distilled in a flask with excess of KIO_3 and $2N.H_2SO_4$, the distillate, which was presumed to be pure bromine, being caught in 10 per cent KI solution. The iodine liberated was estimated by titration with sodium thiosulphate solution, and thus the amount of bromine determined. The observer claimed to have recovered 99.8 per cent of bromine from distillation of known quantities of KBr.

Our criticism of the method is divided into three heads.

(1) The theoretical formulæ of the reactions suggests that iodine as well as bromine should be liberated quantitatively in the proportions Br. : I = 5 : 1. We have been able to demonstrate that this occurs.

The formulæ we suggest are as follows:—

1. $2KIO_3 + H_2SO_4 = K_2SO_4 + HIO_3$
2. $2KBr + H_2SO_4 = K_2SO_4 + HBr$
3. $5HBr + HIO_3 = 2Br_2 + IBr + 3H_2O$

In the KI solution

1. $2Br_2 + 4KI = 4KBr + 2I_2$
2. $IBr + KI = KBr + I_2$

} i.e., an original five parts of bromine liberated six parts of iodine.

No allowance for this was made by the previous observer. Under this heading our experiences were as follows:—

(*a*) To demonstrate qualitatively that iodine distilled over from flask. This was done by receiving the distillate in an iced starch solution. After 15 to 20 minutes' distillation the starch solution was turned a deep blue. This effect was not observed if the receiver was allowed to become hot, as was invariably the case in the original apparatus used. Thus, through not using ice, the previous observer erroneously concluded that no iodine came over.

(*b*) To demonstrate that the iodine was distilled quantitatively according to suggested formula.

This is an example of our experiments:—

In flask A.

0.1 gm. KBr = 0.067 gm. bromine
20 c.c. KIO_3
50 c.c. $2N.H_2SO_4$
Distilled water Q.S.

The distillate was caught in 10 per cent KI solution.

Titrations.

					Distilled for
N/10 thiosulphate	I.	9.2 c.c.	= 0.0736	gm. br.	11 minutes
N/100	II.	3.6 ,,	= 0.00288	,,	15 ,,
,,	III.	0.3 ,,	= 0.00024	,,	20 ,,
,,	IV.	0.7 ,,	= 0.00056	,,	20 ,,
,,	V.	0.5 ,,	= 0.00040	,,	20 ,,
,,	VI.	0.2 ,,	= 0.00016	,,	20 ,,
,,	VII.	0.05 ,,	= 0.00004	,,	20 ,,
		Iodine	= 0.07788	gm. br.	

This figure represents $\frac{5}{6}$ bromine + $\frac{1}{6}$ iodine.
Therefore true figure for bromine $\frac{5}{6}$ × 0.07788 = 0.0649 gm.
Error = 3.5 per cent.

With smaller quantities of bromine the number of distillations required was proportionately less, but at least three to twenty minutes each was essential. This adds considerably to the inconvenience and source of error of the method.

(2) Our second objection was based on the opinion that the presence of NaCI in urine would introduce a source of error. In the original work it was stated that no reaction occurred between the chloride and the reagents in the dilutions used. Since the action of HCI on iodate is a well-known means of estimating the latter, we were not prepared to accept that statement without testing it.

We performed a series of tests using known quantities of NaCI, and also known quantities of urine whose chloride content was known. In every case there was a liberation of a variable quantity of iodine. As will be seen in the results given in the protocol, such quantities are liable to introduce a source of error outside the range of the experimental factor, claimed by the author of the method, particularly in the later stages of avertin excretion, when the amounts to be estimated are small.

(3) The two preceding objections having rendered the method useless for our purpose, we have not proceeded with experimental support for our third objection, which, therefore, we advance only in theory. It is not known yet, definitely, in what form avertin is excreted in the urine, but it seems probable that it may be in the form of a glycuronate compound. Therefore it is extremely likely that the process of fusing with sodium carbonate in an open crucible will tend to result in the conversion of bromal compounds into bromoform and other volatile bodies with the consequent loss of bromine

We wish to express our gratitude to Dr. Gainsborough and Mr. Gardner for their helpful advice and criticism.

PROTOCOLS.

	gm. Br.	gm. Br.	Iodine liberated = Br.	True Br. recovery	% Error	No. of distillation
1.	0.1	0.067	0.07688 gm.	0.064 gm.	4.7	3
2.	0.1	0.067	0.0733 gm.	0.061 gm.	9.4	2
3.	0.1	0.067	0.07788 gm.	0.0649 gm.	3.5	7
4.	0.05	0.0335	0.0416 gm.	0.0346 gm.	3.1	4
5.	0.005	0.00335	0.0038 gm.	0.00323 gm.	3.8	4

In each case the distallation was done with 20 c.c. $2N.H_2SO_4$ and 20 c.c. KIO_3 7 per cent solutions.

Experiments to prove objection (2):—

1. Distilling 10 c.c. of 1 per cent solution of NaCl with the usual reagents, 50 c.c. of $2N.H_2SO_4$ and 20 c.c. KIO_3, into starch solution produced a blue colour in the starch, showing that iodine had been liberated by NaCl.

2. A similar experiment in which 100 mgms. NaCl liberated iodine in KI solution; in an amount equivalent to 0.00024 gm. of bromine.

3. Another experiment using 50 mgms. of NaCl showed a liberation of iodine equivalent to 0.00016 gm. bromine.

4. 50 mgms. NaCl distilled with 20 c.c. $2N.H_2SO_4$ and 20 c.c. KIO_3 solution, liberated iodine equivalent to 0.00056 gm. bromine.

5. 10 c.c. urine of a normal person containing 74 mgms. NaCl (as estimated by Volhard's method) was treated according to the directions given in the paper under discussion.

The result was the liberation of iodine equivalent to 0.00472 gm. bromine.

SECTION OF ANÆSTHETICS.

(The British Medical Association at Winnipeg.)

Specially reported in the "Journal" by F. B. Parsons, M.B.

SEVERAL interesting papers were read at the Annual Meeting of the above Section, which was held from August 26th to 29th under the Presidency of Mr. R. E. Apperly of London.

At the first session Dr. H. W. Featherstone read a paper entitled "Anæsthesia for operations upon the gravid uterus." Many methods were available, he said, for producing anæsthesia for these operations, and, as muscular relaxation and freedom from congestion were necessary, ether, ether-chloroform mixtures or spinal analgesia gave excellent results. N_2O and O gave a sufficiently deep anæsthesia for manipulations, but chloroform was, generally, the most useful anæsthetic for labour. Ether was safe but pungent, and avertin, although pleasant, prolonged labour. He had found spinal analgesia a safe and valuable procedure for evacuation of the uterus and for Cæsarean section. The loss of blood was very small, and the fœtus was free from embarrassment.

During the discussion which followed, Dr. S. Johnstone considered premedication to be of great importance. He pinned his faith to nitrous-oxide-oxygen anæsthesia for this type of work. In no circumstances would he allow a patient to administer chloroform to herself. He preferred to use ether. Professor W. Webster, Winnipeg, objected to spinal anæsthesia on the grounds that it was accompanied by a contraction of the circular muscle of the uterus which was prone to delay labour.

Dr. M. E. Botsford regarded nitrous-oxide-oxygen as safest. She had found that sodium amytal gave good results to the mother, but that many fatalities had occurred to the child. Dr. D. Lamb said that the method of administering chloroform to parturient women as practised in the British Isles was perfectly safe and perfectly effective. Dr. J. S. Lundy said it had been shown recently that chloroform had very little effect upon newly-formed liver and, no doubt, accounted for the innocuousness of this anæsthetic upon the fœtus, while the President stated that this statement threw considerable light upon work which he did some years ago upon the variable effects of chloroform upon liver.

Dr. I. W. Magill read a paper upon "Technique in endotracheal anæsthesia." This form of anæsthesia, he said, was attaining popularity for certain operations, but it would be used more frequently

if the technique of intubation was more generally mastered. The fundamental principle was the provision of an airway that was impervious to obstruction. He preferred to use low pressure or no pressure for ordinary cases. For either oral or nasal intubation the head should be at right angles to the trunk and, if the pharynx was cocainised, oral intubation could be performed satisfactorily under light anæsthesia.

Dr. Magill regarded nasal intubation as most valuable. He described his method, which consisted of passing a suitable length of curved commercial rubber tubing of appropriate length through one nostril. The tip of the tube, the position of which should be visualised, would pass into the glottis. As the tube was of wide bore, free to-and-fro respiration could be maintained upon ordinary inhalation principles. Ample high pressure was available if required. In every case the pharynx was packed with gauze to ensure that respiration took place through the nose and in order to prevent blood reaching the trachea.

Dr. R. Waters preferred the single tube method; with the double tube there was a tendency to wash CO_2 out of the body. Did Dr. Magill use CO_2 to widen the vocal cords when intubating? He used a special inflatable cuff round the tube instead of packing the pharynx. Other speakers in the discussion congratulated Dr. Magill upon the simplicity of his methods, and the opinion was expressed that insufficient use was made of endotracheal anæsthesia in North America.

At the second session Dr. D. C. Arkenhead read a paper entitled "Post-operative respiratory complications during a four-year period." He had analysed the records of 33,066 operations during 1926–29, and out of 31,301 of general anæsthesia had found 55 cases with respiratory complications, including 23 deaths. Half of this series received ether, and approximately one sixth received N_2O after the usual pre-operative medication. The series covered all types of patients of all ages.

Of the 55 complications, 13 were of a minor nature, whilst 42 were pneumonic processes. Of these 42, 19 had gross sepsis present at operation and, of these, 14 died. Curiously, gas anæsthesia was followed by a higher rate of pulmonary complications than ether, probably on account of the fact that it was the anæsthetic of choice in debilitated patients.

He concluded that splinting of the abdominal muscles by pain and tight binders tended to produce circulatory stasis at the bases of the lungs. Gross sepsis at the time of operation predisposed to post-operative pneumonia, but the careful selection of patients for operation minimised this risk.

The President commented upon the magnitude of Dr. Arkenhead's figures, and he considered that the introduction of atropine had

abolished many of the cases of post-operative pneumonia which were seen 20 years ago. He did not think the inhalation of septic material was, in itself, a cause of respiratory trouble. There was no routine method for the prevention of these complications and each case had to be considered individually. Dr. La Fleche said that the incidence of lung complications was due to many factors, which he enumerated; the correct term was post-operative and not post-anæsthetic. Dr. Featherstone considered that upper abdominal operations, shock, and infection were the most important ætiological factors.

A discussion arose regarding the frequency of lung abscess after tonsillectomy in North America compared with its rarity in Great Britain. Two factors were probably responsible: (1) the fact that in America tonsils were removed in the sitting-up position and (2) infection of the nasal sinuses was comparatively common in that country.

Dr. Zerfas read a paper upon "Sodium Amytal." This was a derivative of barbituric acid which was rapidly and completely destroyed in the body. The drug was given intravenously in doses of three to nine grains, and drowsiness and profound sleep came on quickly. The injection had to be given very slowly, otherwise there was an alarming fall of blood-pressure. Not more than one grain should be injected per minute. Unconsciousness lasted three to six hours. There was ample evidence that sodium amytal was useful as a pre-anæsthetic hypnotic; it should not, however, be regarded as an anæsthetic agent.

Dr. J. S. Lundy said that, in common with other barbiturates, toxic doses of sodium amytal caused acute pulmonary œdema. Sometimes the injection of an ordinary dose was followed by excitement instead of narcosis. This he ascribed to the production of isomers.

Dr. Botsford extolled the use of sodium amytal and other basal narcotics in children because they abolished the dread of operation. She gave the drug by mouth in the form of capsules.

Dr. Moore described the good effects following the intramuscular injection of sodium amytal for obstetrical work.

Dr. Parsons emphasised the fact that sodium amytal and all other non-volatile anæsthetics should be regarded as premedicaments. The large range of dosage for sodium amytal, 3 to 45 grains, which had been recommended, appeared unsatisfactory.

At the third session Dr. F. B. Parsons read a paper upon "Avertin." He said that non-volatile anæsthetics were not so popular as volatile inhalation anæsthetics because they were so slowly absorbed and excreted, and the depth of anæsthesia could not be accurately regulated. Avertin, although rapidly absorbed from the rectum, was excreted slowly in the urine. The solution must be carefully prepared and tested before administration. Induction

was most pleasant, and this was the main advantage of the drug. The recommended dose of 0.1 gram per kilo should be observed and if this did not produce full surgical anæsthesia, an inhalation anæsthetic could be given. The drug was 16 times safer than chloroform upon the heart, but respiration was markedly slowed. The mortality rate approximated to that for chloroform. For various reasons, avertin was of particular value in operations for exophthalmic goitre. Its administration should, however, be regarded as a particular form of premedication rather than as an attempt to produce full surgical anæsthesia.

Dr. J. S. Lundy had no doubt that, with improved administration and technique, the mortality rate due to avertin would decrease. He was using a 6 per cent solution of gum acacia as solvent and had obtained better results than with aqueous solutions.

Dr. H. W. Featherstone said that the chief use of avertin was for induction. It was necessary to support the jaw throughout the recovery period for, although the patient was light, there was considerable muscular relaxation.

Dr. E. I. McKesson read a paper upon "Pernocton." This drug was designed to have a large margin of safety and to remove the psychic element from the induction period. It was an hypnotic rather than an anæsthetic.

The average dose of pernocton necessary to produce hypnosis was 4½ grains given intravenously; and volume for volume the drug was more potent than sodium amytal. There was a relatively short period of unconsciousness accompanied by an infinitesimal fall in blood-pressure. There was almost complete absence of excitement during the recovery period. Another advantage of pernocton was the fact that it was issued, already dissolved, in a form suitable for intravenous injection.

In reply to a query by Professor Webster, Dr. McKesson stated that we had come to rely more and more upon the multiplication of anæsthetic agents in the attempt to produce balanced anæsthesia.

ABSTRACTS.

Spinal anæsthesia fatalities. H. KOSTER and M. WEINTROB. *American Journal of Surgery,* April 1930, pp. 234 etc.

The authors have collected a large number of figures and of detailed cases, but these, unfortunately, are generally so incomplete as to be of little help. Messrs. Koster and Weintrob show good reason for not putting much value on the statistics of inhalation and spinal fatalities as an indication of the respective safety of the two methods. As they point out, many deaths really attributable mainly to an inhalation anæsthetic are not so attributed because they do not occur on the table or very soon after. Again, many of the worst risks are, for that very reason, given spinal rather than inhalation anæsthetics. Referring only to one clinic, the authors show how misleading figures may be when the manner of their collection is not made plain. Thus, 49,057 ether administrations with no death attributable to the anæsthetic were reported from a certain clinic. From the same clinic another observer reported 21 deaths in 600 cases, and in six of these he held ether responsible. The element of posture is obviously the main factor in a good many of the fatal cases quoted in this article, and remarkably so in that of a boy of nine whose tonsils were enucleated under anæsthesia produced by the injection of 150mgr. percaine in 6 c.c. cerebrospinal fluid between the second and third lumbar vertebræ. All went well until the nurse sat the boy up in bed to help him expectorate blood after the operation. He stopped breathing, and never recovered. In some of the instances, further, it appears that the large amount of operative interference which was present is ignored, and that really excessive traumatism was the chief element in the fatility.

Obstetrical analgesia. J. T. GWATHMEY. *Surgery, Gynæcology and Obstetrics,* August 1930.

Obstetrical analgesia, which is receiving so much attention just now in this country as well as in Germany and the United States, is the subject of an article in which Gwathmey continues the record of his synergistic method. This now consists in (1) three intramuscular injections of magnesium sulphate, each of 2 c.c. of 50 per per cent solution; (2) an injection of morphine sulphate ¼ gr., given with the first injection of mag. sulp. only; (3) rectal instillation of quinine alkaloid gr. 20, alcohol m. 40, ether oz. 2½, petrolatum liquid or olive oil ad. oz. 4.

It does not appear to us that this proceeding can justly be described as meeting one of the first requirements for labour anæsthetics, viz., simplicity. In hospital, no doubt, the method might, and evidently has been, attended with excellent results, though in many instances the amount of analgesia appears insufficient. In private practice the method would require either constant attendance of the practitioner, or entrusting to the nurse a series of injections, the making of which, if she is not especially skilled, may well lead to trouble. Gwathmey's figures show use of the method in over 20,000 cases, as long ago as 1928.

Preliminary report on nupercain. Ed. L. Keyes and H. M. McLellan. *American Journal of Surgery,* July 1930.

Nupercain is the local anæsthetic which we know as percain. It is dispensed in ampoules, dissolved in physiological saline with one drop of concentrated hydrochloric acid per litre of solution. Alkalinity is fatal to the solution. The authors report on nupercain as a local anæsthetic and for caudal and spinal analgesia. Their conclusions are that it is an excellent local anæsthetic in about ten times the dilution of cocain; that the solution must be kept slightly acid; that it may be boiled, and that it may be used in conjunction with adrenalin. The minimum reported lethal dose for an adult is 90 c.c. of 1 : 1000 solution (90 mg.). For caudal anæsthesia, 30 c.c. of 1 : 1000 (30 mgr.) have been the usual dose, and 2 c.c. of 1 : 200 solution (10 mgr.) for spinal. The authors prefer nupercain to procain. Its effects are more durable.

Sodium amytal in surgical management. J. T. Mason, J. W. Baker, and F. Pilcher. *American Journal of Surgery,* July 1930.

The authors report on 305 patients who have had sodium amytal by intravenous injection. They recommend the use of the drug as a pre-anæsthetic, not as a complete anæsthetic by itself, and they give a preliminary sedative hypodermic. The drug is used in 10 per cent solution, and there is wide individual difference in reaction towards it. The minimum dose needed to abolish consciousness varied from 3 to 9 grains. In one instance 19 grains were required for that purpose. Age and general condition have more influence than body weight on the amounts required. Old or debilitated people fall asleep after 3 or 4 grains have been given. The pupils are contracted and sometimes fixed; the cornual reflex diminished. The average fall of blood pressure is 32 mm. Hg. (systolic). Respirations are shallow and pulse quickened. The reflexes are diminished but not abolished. From the patient's point of view the induction is pleasant. Excitement is rare, but laryngospasm occurs in a small proportion of patients, and on three occasions was

so unpleasant that the administration was stopped. The chief complication to be feared is pulmonary congestion from the diminished respiratory excursion, and to avoid this a mixture of 5 per cent CO_2 with oxygen should be used to ventilate the lungs at the close of the operation.

Z. A. Gruge and P. E. Hoffman (*ibid*) report on the oral administration of sodium amytal. It is given one half to one hour before operation. The authors conclude that "confusion, lack of orientation, visual disturbances and intestinal consciousness are attributable to the action of this drug, and these, together with the necessary intensive vigilance over the patient during the duration of hypnosis, constitute a serious drawback to the use of this drug."

C. G. Heyd (*ibid*) has employed sodium amytal largely in thyroid cases, often in conjunction with ethylene. He gives intravenous injections at the rate of 1 c.c. (100 mgr.) per minute, or more slowly. He has used almost every kind of anæsthetic in conjunction with amytal, and is very satisfied with it.

Effect of avertin on the liver function. M. Bruger, Wesley Bourne, and N. B. Dreyer. *American Journal of Surgery*, July 1930.

As a result of experiments on dogs and of observations on the human subject, the authors conclude that avertin produces a negligible amount of damage to the liver, and its effect on hepatic function compares favourably with that of amytal and the inhalation anæsthetics. A transient kidney depression is produced by avertin, and there is increase in phosphoric output and a mild degree of acidosis.

Cardiac disease in relation to anæsthesia. Mark C. Lidwill. *"Transactions of the Third Australian Medical Congress."*

The author distinguishes three types of heart failure :—

1. Failure of the neuromuscular mechanism (the sino-auricular node and the bundle of His and Purkinje's fibres). This system can be affected by poisons, or by the vagus.

2. Failure of the muscle itself. This can be produced in acute form only, by anoxæmia or cutting off the blood supply of the muscle. Poisons acting acutely (for example, anæsthetics) would kill the neuro-muscular mechanism long before they would kill the muscle.

3. Ante-mortem clotting of the heart's blood.

Lidwill prefers ether to nitrous oxide whenever there is considerable cardiac damage. Stoppage of the heart from the second and third causes enumerated is irreparable. From the first cause, neuromuscular failure, stoppage may be removed if appropriate electric

stimulation can be applied, and the writer has devised a machine for this purpose. A needle is plunged into the left ventricle while an electrode rests on the arm or elsewhere. He relates the case of a stillborn child resuscitated in this way when other measures, including injection of adrenalin, had failed.

Reseaches on the higher gas narcotics of the hydrocarbon series. series. H. KILLIAN. *Schmerz,* July 1930.

A long account of experimental work, mostly on ethylene, acetylene, propylene and narcylene. The article will be valued by those who are interested in the chemistry and physiology of these drugs. With regard to explosibility, the author finds that in a mixture of gas and oxygen and ether, the higher the ether content the less is the explosibility.

Investigations of the effects of various doses of avertin on man. D. VON KLINKO. *Schmerz,* June 1930.

The author has sought to find the dose which, while gaining all the psychic advantage and the ether reduction, has none of the dangers of a full dose of avertin. He concludes that doses of 0.06 and 0.08 gr. per kilo are safe, and give most of the advantages that avertin can procure. He recommends the former dose for weak persons and those who are cachectic, 0.07 for women, and 0.08 for men as routine doses.

In the same volume, G. SCHULTZE-WOLTERS relates clinical researches into the amnesia of avertin narcosis. The patients were submitted during the injection of avertin to stimuli of sight, hearing, smell, touch, and of the intellect by the recital of a short story, amusing and tragic. Then, after recovery, investigations were made as to the amount remembered of the different sensations that had been evoked before narcosis. Tables are given, showing the results statistically, and it is interesting to see that sight amnesia occurred in only 32 per cent, compared with 76 per cent of hearing amnesia.

The intravenous infusion of avertin—being tried in Germany. K. HEIM. SCHMERZ, June 1930, pp. 101 etc.

The induction of anæsthesia is extremely rapid. Kirchener has reported 300 cases of the introduction of avertin into the bloodvessels without any accident. The dosage employed by the author has been 0.03 gr. per kilo of body weight. He describes a deep sleep as coming on suddenly, about 40 seconds after the start of the infusion. He has used the method in 60 cases, and approves of it for midwifery, to be given near the time of greatest pain, or when there is difficulty in delivery, or with the placental extraction. The patients require no previous preparation.

CORRESPONDENCE

A PROTEST AGAINST THE INDULGENCE IN THE MECHANICAL FORMS OF ANÆSTHETIC ADMINISTRATION

By R. W. HORNABROOK, *Melbourne, Australia.*

To the Editor.

Dear Sir,

I think that it is about time I sat down and dropped you a line of appreciation upon the editorial in the April number—"Machines and Men."

"Them's my sentiments" is what very many of us think to-day.

I do wish the modern anæsthetist would get a psychological knowledge of his patients and endeavour to handle them less as cases to be anæsthetized and more as human beings with feelings that are very susceptible at the time. The handling of a patient prior to and during induction is almost more important than the actual prolonged administration. The modern anæsthetist is so wrapped up with the control of stop-cocks and valves that he has almost lost the art of simple administration. If I were asked, "What are the main faults in anæsthetic administration to-day," I would not have the least hesitation in saying:

Firstly, *Rush Inductions*. This is a common and almost universal fault. A properly administered 'push' induction under any form of general inhalation anæsthesia is one of the most pleasant experiences any one can have. It is a most delightful drift into oblivion. The only general inhalation anæsthetic to which this remark does not apply is a straight out ether induction, but even in the case of ether induction the sensations need not be unbearable if men will induce quietly with plenty of air and with the head and shoulders well raised. Personally, I never give a straight-out ether induction, but use either open ethyl chloride (and this should also be used sparingly at the outset, and not

rushed as so very many men do), or else I use a few drops of chloroform with the mask, which is of one layer of flannel only, held well away from the face and gradually brought near: and as the soothing effects of the chloroform vapour act on the larynx so is ether added to the mask, so that the actual induction is really with ether but always during induction the head and shoulders are kept *well raised* at a natural angle. This raised position of the head and shoulders during induction is a most important point. The least an anæsthetist can do is to learn the art of giving his patient "the pleasure" of a decent induction. This can never be attained by rush or "upper cut" methods.

Now as to the second big fault of the average anæsthetist (this is by no means confined to the novice). Many experts with years of experience also fail in this respect; that is, "over-doping of the patient with general anæsthetic." To see some men at work, even men with big reputations, one would think that they were endeavouring to find out how much anæsthetic they could pour into the patient without killing him, instead of endeavouring to maintain a surgical anæsthesia with the absolute minimum consumption of anæsthetic. There is not one operation, from the crown of the head to the sole of the foot, that cannot be performed in a stage of anæsthetic sleep with just deepening-up during certain stages when nerve areas are being touched up or organs dragged about. To maintain a patient at the same depth of anæsthesia throughout an operation is the stamp of the incompetent anæsthetist, not of the competent one. It is for this reason that an anæsthetist should not only know his anatomy and the nerve areas being handled at the operation, but he should also have a rough knowledge as to what the surgeon is doing, or attempting to do.

Ether still stands out as the anæsthetic of choice, above all others, if men will learn to handle it correctly. A patient under properly administered open ether will give better relaxation than under any other general inhalation anæsthetic except chloroform. To see some men at work, using open ether, makes one feel inclined to weep and give the administrator a dose of his own poison. I have known men to use from 12 to 16 ounces of ether in one hour upon a patient, the

mask frozen and ether dropping off it, and then not give a decent administration. And no wonder, for they were over-doping their patient with concentrated ether when they should have been using at the utmost from four to five ounces in the hour. The average patient, if properly handled, can be kept fully surgically anæsthetized with from three to four ounces an hour after he has been properly induced. It is no wonder that anæsthetists who use from 12 to 16 ounces of ether upon their patients in an hour find their patients liable to post-operative vomiting and a tendency to broncho-pneumonia. Not only do these men render their patients liable to the above post-operative complications, but during the operation they will get abdominal rigidity, more or less marked, due to their failure to supply the patient with a sufficiency of air; for in a majority of cases when a patient is surgically anæsthetized it is the asphyxial condition brought about by this over-concentration of the anæsthetic which is the main factor in causing muscular rigidity. It is air, not anæsthetic, that the patient wants. The anæsthetic that gives you surgical anæsthesia with a minimum of anæsthetic and a maximum of air is the one that gives you the best relaxation. So we see chloroform and ether standing out above the more modern anæsthetics in use, viz., nitrous oxide, ethylene, somnoform and ethyl chloride.

The analgesic periods are also more marked and prolonged under chloroform and ether than they are under the more modern inhalation anæsthetics. This is of considerable advantage in that there are very few operations indeed that cannot be carried out either in part or throughout in this analgesic stage with advantage to both surgeon and patient, especially so if a preliminary small dose of $\frac{1}{8}$ gr. morphia and $^1/_{130}$th gr. atrophine has been administered beforehand, and the patient's eyes well covered from all light.

We have heard a lot, recently, about the great advantage of avertin for operative work. This anæsthetic should not be used as an anæsthetic *per se*, but in small doses and more as an adjunct to ether. It permits very small quantities of ether to be administered to obtain a full surgical anæsthesia and thus conduces to better relaxation and quiet respiration.

The use of avertin as an anæsthetic *per se* will sooner or later land the man who so uses it in the death of his patient.

The remark is often made that ethylene and nitrous oxide have the great advantage that a patient wakes immediately following upon cessation of administration. This is not by any means always an advantage, for it is really more comfortable for the patient to have a quiet recovery with a prolonged semi-conscious analgesia period which can be secured under ether. Again, to-day there is practically no post-operative vomiting after ether, nor is there any risk of lung complications, provided the anæsthetic has been properly administered and cut down to the absolute minimum with a maximum of air.

If anæsthetists would leave instructions that about two and a half hours prior to operation the patient should have two or three fairly large slices of bread and butter with plenty of *sugar* on the bread, and also a small cup of tea with sugar in it, they would find that not only does their patient come down to the operating theatre in a better condition for operation than would be the case if no food had been given, but also that there is far less chance of post-operative vomiting. Also, following upon an operation, as soon as a patient feels able to take it, he should be given some water sago with plenty of sugar.

If the anæsthetist should run across a case in which there is frequent post-operative vomiting, this can be stopped by permitting the patient to have an ice cream, following this about a quarter of an hour later by the water sago and sugar.

A patient should never be severely purged prior to operation.

The present craze for complicated anæsthetic apparatus, numerous cylinders of various anæsthetic agents, multiplicity of stop-cocks and valves with electrical connections strewn across the floor, driving pumps and suction tubes, is really all quite unnecessary and has not tended to improve anæsthetic work in the majority of instances. In fact, I think the suction tube very often does more harm than good in tonsillectomy work by encouraging hæmorrhage, in that it prevents the formation of clotting or tends to remove small clots that may form.

Some men have a tendency towards over-use of endotracheal anæsthesia. It is very rarely indeed that this form of anæsthetic administration is warranted, and the surgeon or anæsthetist who does use it upon unneccessary cases is not playing cricket by his patient. There is hardly an instance in which either pharyngeal or naso-pharyngeal methods of administration cannot be used equally well, or indeed, with advantage over endotracheal administration. As for the surgeon who desires endotracheal anæsthesia for abdominal work, I cannot speak too strongly in condemnation of such a man. All the advantages claimed for endotracheal administration can be secured by a properly administered pharyngeal or naso-pharyngeal method and with distinct advantages to the patient.

The modern craze for mechanical anæsthetic methods with the multiplicity of stop-cocks and valves, and in some instances the presence of a foreign body in the larynx, in the desire to be considered "up-to-date" and of "the very latest," is of little satisfaction to the patient or his relatives should he acquire broncho-pneumonia or pass out under "the very latest."

Multiplicity of stop-cocks and valves with numerous cylinders and extensive electrical connections do not necessarily tend to safety, but rather to lessen it.

A final word: never commence your induction under any method unless you are assured by your patient that he is comfortable. It is impossible to obtain a quiet induction with a patient in an uncomfortable position. Also, always inform your patient of the possible sensations he may encounter during induction, such as fullness of the head, increased action of the heart, and extreme acuteness in hearing, with a rather pleasant feeling of going to sleep from the feet upwards, just prior to the drift "into the beyond."